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be heard in this place, unique on earth, a bombardment of *Leonid* meteors is impressive beyond the power of language to portray.

At $1^h\ 54^m$ a cloud suddenly condensed round about a summit and obscured *Leo* until $2^h\ 53^m$. A few straggling meteors were seen emerging from the edges, but they were not counted. Omitting these 59^m the rate of fall was 657 meteors in 281 minutes or 2.34 per minute. The fall from 4^h to $4^h\ 20^m$ was five per minute, and the highest number seen at once was five. The trend of nearly all was from *Leo* to west and southwest, a limited number going to the north. When *Leo* was well up some appeared to drop into Los Angeles' distant electric sea of lights, others into the ocean, and still others into the gaping mouths of the cañons. All this was due to perspective; none reached the Earth. The mirror of the heliostat was set on the rising point of the radiant and spectroscope adjusted in the hope of securing spectra. None was obtained. No meteor came from the exact radiant. After the cloud dissolved, at $2^h\ 53^m$, all was clear until dawn. And thus passed the memorable shower of *Leonids* of 1901.

LOWE OBSERVATORY, ECHO MOUNTAIN P. O., CAL., NOV. 18, 1901.

PLANETARY PHENOMENA FOR JANUARY AND FEBRUARY, 1902.

BY MALCOLM MCNEILL.

JANUARY.

January, 1902, is not a favorable month for observation of the planets, with the exception of *Mercury* and *Venus*. Several of the others are in the western sky for a short time after sunset, but they are too low down to be easily seen.

Mercury passes superior conjunction with the Sun on January 1st and becomes an evening star, but does not get far enough away to be conspicuous until after the middle of the month. At the end of the month it remains above the horizon about an hour and a half after sunset. It passes *Saturn* on January 6th, *Jupiter* on January 9th, and *Mars* on January 23d. The last named conjunction is rather close, *Mercury* being less than the Moon's diameter south of *Mars*.

Venus is pre-eminently the evening star, remaining above the horizon several hours after sunset, and being also at its greatest brightness early in the month. It can be seen in full daylight at any time during the month when it is above the horizon. It gradually draws nearer the Sun, although its eastward motion among the stars continues until January 22d.

Mars is still in the southwestern sky just after sunset, but has for some time ceased to be conspicuous. It remains above the horizon about an hour and a half after sunset on January 1st, but can not easily be seen on account of its low altitude and faintness.

Jupiter and *Saturn* are still not far apart, but the eastward motion of the Sun among the stars is so much greater than that of the planets that it overtakes and passes them,—*Saturn* on January 9th, and *Jupiter* on January 15th. The planets then become morning stars, but do not attain a sufficient distance from the Sun to make themselves visible as morning objects until after the close of the month.

Uranus passed conjunction with the Sun early in December, and is now to be found in the east just before sunrise, but too low and faint to be easily seen.

Neptune is above the horizon most of the night in the region between *Taurus* and *Gemini*, but can not be seen without a telescope.

FEBRUARY.

The conditions for observation of the planets are even worse in February than they were in January, except perhaps in the case of *Mercury*. That planet comes to greatest east elongation on the morning of February 3d, and up to the middle of the month does not set for more than an hour after the Sun. The present greatest elongation is only 18°; but the planet is a considerable distance north of the Sun, and this in a measure compensates for the smallness of the distance. At the following greatest east elongation toward the end of May the distance will be 23°.

Venus is still very conspicuous as an evening star, at the beginning of the month setting about two hours after sunset on February 1st; but it has begun its retrograde motion among the stars, and this in combination with the eastward motion of the Sun brings the planet into inferior conjunction with the Sun on February 14th. It then becomes a morning star and will remain so until November 28th.

Mars is still east of the Sun, and is near the southwest horizon just after sunset; but the Sun is rapidly drawing nearer to it in their common eastward motion, so that at the end of the month their distance apart is only 6°. Throughout the month the planet is too near the Sun and too faint to be seen without a telescope.

Jupiter and *Saturn* become morning stars in January, and by the close of the month will rise an hour and a half to two hours before sunrise. *Saturn* precedes *Jupiter* more than half an hour, but the greater brightness of *Jupiter* will make him more easily visible.

Uranus rises two hours or more earlier than the last two planets, and may be found in the region between *Scorpio* and *Sagittarius*.

Neptune is in about the same place as the one it held in January, between *Taurus* and *Gemini*.

EXPLANATION OF THE TABLES.—The phases of the Moon are given in Pacific Standard time. In the tables for Sun and planets, the second and third columns give the Right Ascension and Declination for Greenwich noon. The fifth column gives the local mean time for transit over the Greenwich meridian. To find the local mean time of transit for any other meridian, the time given in the table must be corrected by adding or subtracting the change per day, multiplied by the fraction whose numerator is the longitude from Greenwich in hours, and whose denominator is 24. This correction is seldom much more than 1^m. To find the standard time for the phenomenon, correct the local mean time by *adding* the difference between standard and local time, if the place is west of the standard meridian, and *subtracting*, if east. The same rules apply to the fourth and sixth columns, which give the local mean times of rising and setting for the meridian of Greenwich. They are roughly computed for lat. 40°, with the noon Declination and time of meridian transit, and are intended as only a rough guide. They may be in error by a minute or two for the given latitude, and for latitudes differing much from 40° they may be several minutes out.

JANUARY–FEBRUARY, 1902.

PHASES OF THE MOON, P. S. T.

Last Quarter . . .	Jan.	1,	8^h	8^m	A. M.
New Moon . . .	Jan.	9,	1	15	P. M.
First Quarter . . .	Jan.	16,	10	38	
Full Moon . . .	Jan.	23,	4	6	
Last Quarter . . .	Jan.	31,	5	9	A. M.
New Moon . . .	Feb.	8,	5	21	
First Quarter . . .	Feb.	15,	6	57	
Full Moon . . .	Feb.	22,	5	3	

THE SUN.

1902.		R. A.	Declination.	Rises.	Transits.	Sets.
Jan.	1,	$18^h\ 44^m$	— 23° 4′	$7^h\ 26^m$ A.M.	$12^h\ 3^m$ P.M.	$4^h\ 40^m$ P.M.
	11,	19 28	— 21 54	7 27	12 8	4 49
	21,	20 11	— 20 3	7 22	12 11	5 0
	31,	20 53	— 17 33	7 15	12 14	5 13
Feb.	10,	21 33	— 14 33	7 4	12 14	5 24
	20,	22 12	— 11 09	6 52	12 14	5 36
Mar.	2,	22 50	— 7 26	6 37	12 12	5 47

MERCURY.

Jan.	1,	18 43	— 24 50	7 34 A.M.	12 2 P.M.	4 30 P.M.
	11,	19 54	— 23 0	7 57	12 34	5 11
	21,	21 4	— 18 36	8 9	1 4	5 59
	31,	22 3	— 12 14	8 6	1 24	6 42
Feb.	10,	22 26	— 7 20	7 32	1 7	6 42
	20,	21 54	— 8 51	6 26	11 55 A.M.	5 24
Mar.	2,	21 29	— 12 40	5 36	10 52	4 8

VENUS.

Jan.	1,	21 45	— 13 47	9 51 A.M.	3 4 P.M.	8 17 P.M.
	11,	22 6	— 10 11	9 20	2 45	8 10
	21,	22 15	— 7 5	8 39	2 15	7 51
	31,	22 9	— 5 5	7 47	1 30	7 13
Feb.	10,	21 50	— 4 45	6 47	12 31	6 15
	20,	21 26	— 6 2	5 49	11 29 A. M.	5 9
Mar.	2,	21 12	— 7 56	5 2	10 35	4 8

MARS.

Jan.	1,	20 8	— 21 20	8 43 A.M.	1 27 P.M.	6 11 P.M.
	11,	20 41	— 19 29	8 29	1 20	6 11
	21,	21 13	— 17 17	8 13	1 13	6 13
	31,	21 44	— 14 46	7 56	1 5	6 15
Feb.	10,	22 14	— 12 1	7 37	12 56	6 15
	20,	22 44	— 9 4	7 17	12 46	6 15
Mar.	2,	23 13	— 6 0	6 56	12 36	6 16

JUPITER.

Jan.	1,	19 33	— 22 0	8 9 A.M.	12 52 P.M.	5 33 P.M.
Feb.	1,	20 4	— 20 44	6 35	11 21 A.M.	4 7
Mar.	1,	20 30	— 19 22	5 6	9 57	2 48

Saturn.

Jan.	1,	19 17	—22 6	7 55 A.M.	12 36 P.M.	5 17 P.M.
Feb.	1,	19 32	—21 37	6 6	10 49 A.M.	3 32
Mar.	1,	19 45	—21 9	4 27	9 12	1 57

Uranus.

Jan.	1,	17 10	—23 0	5 52 A.M.	10 29 A.M.	3 6 P.M.
Feb.	1,	17 17	—23 8	3 58	8 34	1 10
Mar.	1,	17 21	—23 12	2 12	6 48	11 24 A.M.

Neptune.

Jan.	1,	5 59	+22 15	3 56 P.M.	11 16 P.M.	6 36 A.M.
Feb.	1,	5 56	+22 16	1 51	9 11	4 31
Mar.	1,	5 54	+22 17	noon	7 20	2 40

ECLIPSES OF *JUPITER'S* SATELLITES.

Jupiter is too near the Sun for observations of eclipse of satellites.

OBSERVATIONS OF THE VARIABLE STARS *W LYRÆ* AND *U_3 CYGNI.*

BY ROSE O'HALLORAN.

According to the *Companion to the Observatory*, a minimum of the long-period variable, *W Lyræ*, was due on May 8th and a maximum on August 21st of this year. About sixty observations were obtained between April 21st and September 14th, but the following list includes only those showing distinct gradations and some seeming fluctuations. Clouds hindered observation from August 2d to 24th, but no doubt it was clear elsewhere during the time of the predicted maximum. Three days after that date the star had fallen to 9.4 magnitude, and unless the decline was very rapid, it is probable that the maximum occurred long before the date of prediction, as it had risen to eighth magnitude seven weeks previously. On April 21st and 26th, May 4th, 7th, and 8th it was invisible in a four-inch lens.

May 17. Equal to *t*, classed as of 12th mag.
" 23. Equal to *g* of 10th mag.